

CLAIMS

1. An apparatus for controlling valve actuation in an internal combustion engine having intake and exhaust valves,  
5 wherein the apparatus controls valve actuation of the intake valve and valve actuation of the exhaust valve each to be a corresponding predetermined target valve actuation, the apparatus being characterized by:

first computation means, wherein, according to an  
10 operation state of the engine, the first computation means computes the target valve actuation of a first valve and a target valve overlap amount of the valves, the first valve being one of the intake valve and the exhaust valve, and wherein, based on the computed target valve overlap amount and  
15 an actual valve actuation of the first valve, the first computation means computes the target valve actuation of a second valve, the second valve being the other one of the intake valve and the exhaust valve;

second computation means, wherein, according to the  
20 operation state of the engine, the second computation means computes the target valve actuation of the intake valve and the target valve actuation of the exhaust valve; and

selecting means that selects, as the target valve actuation of the intake valve and the target valve actuation  
25 of the exhaust valve, one of the computation result of the first computation means and the computation result of the second computation means according to the operation state of the engine, and wherein the selecting means selects the computation result of the second computation means when load  
30 on the engine is no less than a predetermined value.

2. An apparatus for controlling valve actuation in an internal combustion engine having intake and exhaust valves,  
35 wherein the apparatus controls valve actuation of the intake valve and valve actuation of the exhaust valve each to be a

corresponding predetermined target valve actuation, the apparatus being characterized by:

first computation means, wherein, according to an operation state of the engine, the first computation means computes the target valve actuation of a first valve and a target valve overlap amount of the valves, the first valve being one of the intake valve and the exhaust valve, and wherein, based on the computed target valve overlap amount and an actual valve actuation of the first valve, the first computation means computes the target valve actuation of a second valve, the second valve being the other one of the intake valve and the exhaust valve;

second computation means, wherein, according to the operation state of the engine, the second computation means computes the target valve actuation of the intake valve and the target valve actuation of the exhaust valve; and

selecting means that selects, as the target valve actuation of the intake valve and the target valve actuation of the exhaust valve, one of the computation result of the first computation means and the computation result of the second computation means according to the operation state of the engine, and wherein the selecting means selects the computation result of the first computation means when the valve actuation of the intake valve and the valve actuation of the exhaust valve each have converged on the corresponding target valve actuation and the valve overlap amount of the valves has converged on the target valve overlap amount.

3. The apparatus according to claim 2, characterized in  
30 that:

the selecting means selects the computation result of different computation means in a case where the valve overlap amount is made smaller than it is at present and in a case where the valve overlap amount is made greater than it is at  
35 present, and

wherein, when the valve actuation of the intake valve and the valve actuation of the exhaust valve each have converged on the corresponding target valve actuation and the valve overlap amount of the valves has converged on the target valve 5 overlap amount, the selecting means selects the computation result of the first computation means irrespective of whether the valve overlap amount is made smaller or greater than it is at present.

10        4. An apparatus for controlling valve actuation in an internal combustion engine having intake and exhaust valves, wherein the apparatus controls valve actuation of the intake valve and valve actuation of the exhaust valve each to be a corresponding predetermined target valve actuation, the 15 apparatus being characterized by:

first computation means, wherein, according to an operation state of the engine, the first computation means computes the target valve actuation of a first valve and a target valve overlap amount of the valves, the first valve 20 being one of the intake valve and the exhaust valve, and wherein, based on the computed target valve overlap amount and an actual valve actuation of the first valve, the first computation means computes the target valve actuation of a second valve, the second valve being the other one of the 25 intake valve and the exhaust valve;

second computation means, wherein, according to the operation state of the engine, the second computation means computes the target valve actuation of the intake valve and the target valve actuation of the exhaust valve; and

30        selecting means that selects, as the target valve actuation of the intake valve and the target valve actuation of the exhaust valve, one of the computation result of the first computation means and the computation result of the second computation means according to the operation state of 35 the engine, and wherein the selecting means selects the

computation result of the second computation means when the valve actuation of the intake valve and the valve actuation of the exhaust valve are both changed to increase or reduce the valve overlap amount.

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5. An apparatus for controlling valve actuation in an internal combustion engine having intake and exhaust valves, wherein the apparatus controls valve actuation of the intake valve and valve actuation of the exhaust valve each to be a corresponding predetermined target valve actuation, the apparatus being characterized by:

primary process control means, wherein the primary process control means computes the target valve actuation of a first valve according to an operation state of the engine, the first valve being one of the intake valve and the exhaust valve, and the primary process control means controls the valve actuation of the first valve to be the computed valve actuation; and

secondary process control means, wherein the secondary process control means computes the target valve actuation of a second valve based on a target valve overlap amount of the valves, which overlap amount is computed according to the operation state of the engine, and an actual valve actuation of the first valve, the second valve being the other one of the intake valve and the exhaust valve, and the secondary process control means controls the valve actuation of the second valve to be the computed valve actuation,

wherein, when one of the valve actuation of the intake valve and the valve actuation of the exhaust valve is changed to increase the valve overlap amount and the other valve actuation is changed to reduce the valve overlap amount, the primary process control means and the secondary process control means execute the valve actuation control by setting the valve that is related to the reduction of the valve overlap amount as the first valve and setting the valve that

is related to the increase of the valve overlap amount as the second valve.

6. The apparatus according to claim 5, characterized by:

5 discrete process control means, wherein the discrete process control means computes the target valve actuation of the intake valve and the target valve actuation of the exhaust valve according to the operation state of the engine, and the discrete process control means controls the valve actuation of  
10 each valve to be the corresponding target valve actuation, and wherein the valve actuation control by the primary process control means and the secondary process control means, and the valve actuation control by the discrete process control means are selectively executed according to the  
15 operation state of the engine.

7. An apparatus for controlling valve actuation in an internal combustion engine having intake and exhaust valves, wherein the apparatus controls valve timing of the intake  
20 valve and valve timing of the exhaust valve each to be a corresponding predetermined target valve timing, the apparatus being characterized by:

primary process control means, wherein the primary process control means computes the target valve timing of a  
25 first valve according to an operation state of the engine, the first valve being one of the intake valve and the exhaust valve, and the primary process control means controls the valve timing of the first valve to be the computed valve timing; and

30 secondary process control means, wherein the secondary process control means computes the target valve timing of a second valve based on a target valve overlap amount of the valves, which overlap amount is computed according to the operation state of the engine, and an actual valve timing of  
35 the first valve, the second valve being the other one of the

intake valve and the exhaust valve, and the secondary process control means controls the valve timing of the second valve to be the computed valve timing,

wherein, when the valve timing of the intake valve and

5 the valve timing of the exhaust valve are both being advanced, the primary process control means and the secondary process control means execute the valve timing control by setting the exhaust vale as the first valve and setting the intake valve as the second valve,

10 wherein, when the valve timing of the intake valve and the valve timing of the exhaust valve are both being delayed, the primary process control means and the secondary process control means execute the valve timing control by setting the intake vale as the first valve and setting the exhaust valve  
15 as the second valve.